

Extraction of Zr and Hf into Trioctylamine in Toluene from Oxalic Acid Solutions

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The aim of this work is to develop model systems to study the chemical properties of the transactinide Rf ($Z=104$), using the on-line SISAK liquid-liquid extraction system [1]. Yakabe et al., studied Hf extraction into trioctylamine (TOA) from oxalic acid [2]. Furthermore, B. Nandi et al. [3], showed that this was the best method for extraction of Hf. Thus, this chemical system was selected for studying the extraction properties of Rf, the heaviest member of group 4 in the periodic table. Its homologues Zr and Hf were used to develop a suitable extraction system.

Manual extractions were performed using 3 mL of each phase. Tracer solutions of ^{88}Zr were added to different concentrations of oxalic acid in 0.3 M HCl (the aqueous phase). The samples were mixed for 20 s with a solution of 0.1 M TOA, 2.5% dodecanol in toluene (the organic phase) and centrifuged. Aliquots of each phase were counted with a Ge detector.

Tracer experiments with ^{88}Zr were performed off-line using a SISAK centrifuge (Fig. 1) and on-line with $^{164}, ^{166}\text{Hf}$ activity produced in the 88 inch Cyclotron. Both phases were collected and counted. The resulting distribution ratios are shown in Fig. 2, together with manual extraction data for Hf [4].

The results show higher distribution ratios for the manual extraction than for the SISAK experiments. Furthermore, the manual extraction gave higher distribution ratios for Hf than Zr. This was not the case when using the SISAK centrifuge, probably due to kinetic effects because of the much shorter contact time in the SISAK centrifuges.

The results show that both Zr and Hf extract fast enough with TOA from oxalic acid to be suitable for SISAK. Thus, the system should also be suitable for investigating the chemical properties of Rf.

References

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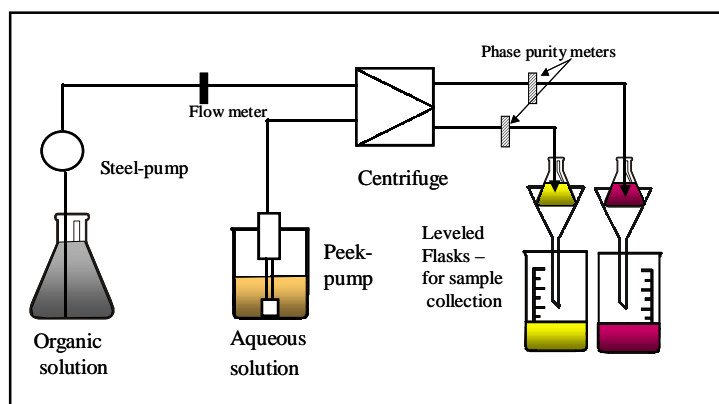


Figure 1. Model system of the tracer experiment with ^{88}Zr .

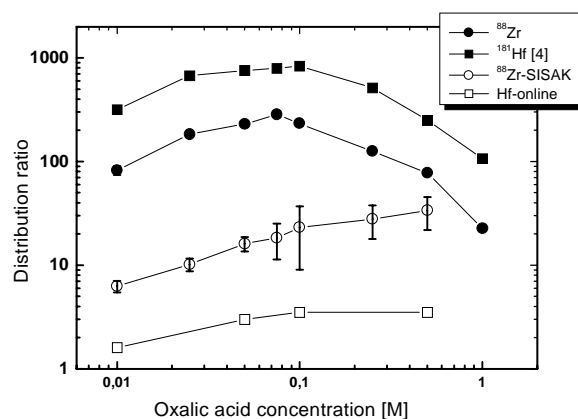


Figure 2. Distribution ratios of Hf and Zr vs. oxalic acid concentration. The values are an average of two experiments for the manual extractions and six for the off-line SISAK extractions. The on-line experiment was performed once.

